Remarks

The Applicants have cancelled Claims 15 and 17 on the one hand and added new Claims 21 and 22 on the other hand. Both of Claims 21 and 22 recite that the precipitate contains Mo and Nb combined with Fe, Cr and Si in grain boundaries of the metallic material. Support may be found in the Applicants' Specification on Page 15, Lines 10 – 12, for example. Entry into the official file is respectfully requested.

Claims 1 and 10 stand rejected under 35 USC §112, second paragraph, as being indefinite. The Applicants believe that the rejection as it applies to Claim 10 is a typographical error and that the rejection was intended to be directed to Claims 1 and 12 as confirmed by the Examiner's helpful comments in Paragraphs 4 and 5 of the Official Action. Thus, the Applicants will address the rejection under the assumption that it is indeed directed to Claims 1 and 12.

The Applicants have amended Claim 1 so that it now recites "when in use at a cell operating temperature" as helpfully suggested by the Examiner. Withdrawal of that portion of the rejection is respectfully requested.

Claim 12 has been amended to recite that the method further comprises "pickling after annealing the cold rolled steel material." Withdrawal of the rejection is respectfully requested.

Claim 10 has also been amended to correct a recurring typographical error with respect to "pickling." Entry into the official file is also respectfully requested.

Claims 1, 4 – 10 and 12 – 20 stand rejected under 35 USC §103 over EP '214. The Applicants note with appreciation the Examiner's detailed comments hypothetically applying EP '214 to those claims. The Applicants respectfully submit that the rejection is now moot with respect to cancelled Claims 15 and 17. The Applicants also respectfully submit that EP '214 is inapplicable to the remaining rejected claims for the reasons set forth below.

Electrical conductivity is an indispensable characteristic feature of materials for fuel cells and changes depending on the types and thickness of oxide included in an oxide layer. The entire thickness of an oxide layer can be roughly estimated from the results of general oxidation experimentation.

Nevertheless, because electrical conductivity is further influenced by the structural ratio and dispersion states of each oxide, for carrying out the evaluation, the electrical resistance of the materials should be determined. Because electrical resistivity changes as a result of differences in oxides, electrical conductivity also changes at times by slight differences in the steel component. For example, SiO_2 and Al_2O_3 have extremely high electrical resistivity and their generated amounts and dispersion state have a large influence on electrical conductivity. Also, as can be seen from the Applicants' Specification on Page 17 at Lines 4 to 9, when the Cr content is small, in an environment wherein a fuel cell is used for tens of thousands of hours, oxidation resistance may not be maintained and the electrical conductivity can possibly be lowered. However, in contrast, when there is too much Cr, not only is workability lowered, but also the structural ratio and dispersion states of each oxide, which influence the electrical conductivity, can change.

The Applicants have a large number of examples in their Specification such as in Tables 1-1 and 1-2 that demonstrate a particularly excellent range of Cr content. Thus, the range of Cr content is amended to 19.65 to 20.45 mass% so that high electrical conductivity can be maintained in an environment wherein a fuel cell is used. Support for these changes may be found within the original claims and the Applicants' Specification. In particular, the new range is fully supported by the original broader range. Also, Steel No. 1 has a Cr content of 19.65 and Steel No. 11 has a Cr content of 20.45. Thus, the range is inherently supported by the larger range and the current end points are represented in the Applicants' examples.

As noted in the rejection, Example Nos. 8 to 10 and No. 12 of EP '214 have some relevance to amended Claims 1 and 10. However, the contents of C, Si and Cr of those Example Nos. 8 and No. 12 and C and Cr of Example Nos. 9 and No. 10 are outside the range specified by amended Claims 1 and 10.

The reason for the change in Cr as specified in amended Claims 1 and 10 were described above. However, the Applicants again note that when the C content is high, the effective amount of Cr decreases and electrical conductivity is lowered. When the Cr content is low, particularly as is the case the case in EP '214, careful attention is required because the value of electrical resistance is uncertain and unpredictable.

The rejection points out that EP '214 teaches that Si fosters precipitation of intermetallic compound. Nonetheless, as set forth in EP '214 in Paragraph [0025] of Page 4, the point of invention in EP '214 is directed to suppression of precipitation of intermetallic compounds to heighten mechanical properties such as strength at a high temperature and is dissimilar to the problem solved by the Applicants in amended Claims 1 and 10 which utilize precipitation. Thus, to suppress the harmful influence of oxidation of Si, the upper limit of Si is set by the Applicants.

The heat treatment conducted wherein test pieces were subjected to a test temperature of 900°C in air for 400 hours, as set out in EP '214 in paragraph [0054], is merely a condition of heat treatment for evaluating oxidation resistance of products and is not for precipitation treatment as specified in Claim 6. Said differently, the EP '214 heat treatment is not the same as Claim 6 wherein, the characteristic feature of products after precipitation treatment (heat treatment) for manufacturing products is taken into consideration.

Therefore, the EP '214 heat treatment has nothing to do with aging treatment as is in Claim 6 of bringing about precipitation and improving the characteristic feature after treatment.

The rejection states that electrical conductivity would be expected from the component of steel. The Applicants respectfully submit that this is unpredictable and not expected. A slight change in component can potentially largely change electrical resistance. Thus, the electrical conductivity should be accurately measured. Otherwise, there is no reasonable assurance of what the electrical conductivity will be.

The rejection states that the material disclosed in EP '214 to be used at 900°C would be expected to be usable at 800°C. However, the material disclosed in EP '214 is, as set out in Paragraph [0001] of Page 2, "steel suitable for members used in high-temperature environments, for example, exhaust pipe of automobiles and motorcycles, outer casings for catalysts, and exhaust ducts in thermal power plants." Those skilled in the art understand from this that this is a material having high temperature strength and excellent resistance to oxidation, but it is difficult to determine from the foregoing description whether or not the material has excellent electrical conductivity, which is the most important characteristic feature of a material for fuel cells, at a temperature both at 800°C or 900°C.

As mentioned above, EP '214 does not disclose a material in which electrical conductivity, which is the most important but unpredictable characteristic feature of a fuel cell, is taken into consideration. Also, the basic technical concepts concerning whether to suppress or to utilize the precipitation of precipitates are different between amended Claims 1 and 10 and EP '214, wherein the technical objectives are the opposite of each other. As proof, there are no examples in EP '214 that satisfy amended Claims 1 and 10.

In view of the above multiple differences of Claims 1, 4 – 10, 12 – 14, 16 and 18 – 20, the Applicants respectfully submit that EP '214 is inapplicable to those claims. Withdrawal of the rejection is respectfully requested.

Claims 1, 4 – 10 and 12 – 19 stand rejected under 35 USC §103 over Grubb. The Applicants respectfully submit that the rejection is now moot with respect to cancelled Claims 15 and 17. The Applicants, nonetheless, respectfully submit that the remaining rejected claims are allowable over Grubb for the reasons set forth below.

The rejection states that, as set forth in the Abstract and Claim 1 of Grubb, a material having excellent mechanical property (creep property) and resistance to oxidation at a high temperature (900°C) is disclosed and this is an art which is equivalent of amended Claims 1 and 10. However, in amended Claims 1 and 10, electrical conductivity at a high temperature of 700 to 900°C is cited as an important characteristic feature, and because this is a feature which is unable to be reasonably presumed as mentioned above, it is impossible to assert that Grubb, which does not even refer to electrical conductivity, discloses the problem much less the solution of amended Claims 1 and 10.

The rejection states that the steel examples of Grubb extremely closely meet the composition in amended Claims 1 and 10 and the constituent elements of claims overlap. However, the total amounts of Cr and Si and Sc, Y, La, Ce and so forth of WC70 to WC73 and the Cr and Si contents of WC74 and WC75 are outside the range of amended Claims 1 and 10.

The reason for selecting the Cr content in amended Claims 1 and 10 has been explained above. Also, as explained above, Si can possibly form oxides having high electrical resistance and, therefore, Si is an element that readily effects electrical conductivity. For this reason, electrical conductivity has to be evaluated. However, no disclosure concerning electric conductivity is found at all in Grubb.

The rejection points out portions which describe precipitates in Grubb and indicates that because the composition and process of making disclosed therein are close to amended Claims 1 and

10, similar precipitates are believed to have been precipitated. However, the generation mechanism and utilization of the precipitates are quite dissimilar.

In particular, Grubb utilizes Laves phase (Fe_2, (Ta, Nb, Mo)) precipitates, as set out from Column 6, Line 65 to Column 7, Line 1, to improve creep resistance at a high temperature. From this, it is considered that probably, precipitation of precipitates in the ferrite grains, which is effective in inhibiting the motion of dislocation, is preferential.

On the other hand, in the Applicants' Specification from Line 13 of Page 8 to Line 7 of Page 9, according to amended Claims 1 and 10, the site of precipitation must be located in the grain boundaries to suppress diffusion of each element from the grain boundaries by precipitates.

Consequently, a steel component is specified in amended Claims 1 and 10. More concretely, by appropriate combined addition of Mo and Nb so as to be within a specified range, priority is given by the Applicants to the precipitation of precipitates in the grain boundaries and, thereby, a layer having high electrical conductivity is successfully formed.

The rejection states that a material having excellent heat resistance at a temperature of 800 to 900°C is disclosed in Grubb and, therefore, an excellent characteristic feature of fuel cells being used in the relevant environment would have been expected. However, the high temperature strength and resistance to oxidation of Grubb are features different from electrical conductivity as mentioned above. Hence, electrical conductivity higher than that of Grubb cannot reasonably be assumed.

As discussed above, there is no disclosure in Grubb of a material for which electrical conductivity, which is the most important but unpredictable characteristic feature of a fuel cell, is taken into consideration. And, as proof, there are no examples in Grubb that satisfy amended Claims 1 and 10.

The Applicants respectfully submit that Grubb is inapplicable to Claims 1, 4 – 10 and 12 – 19 for the multiple reasons set forth above. Withdrawal of the rejection is respectfully requested.

In light of the foregoing, the Applicants respectfully submit that the entire application is now in condition for allowance, which is respectfully requested.

Respectfully submitted,

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